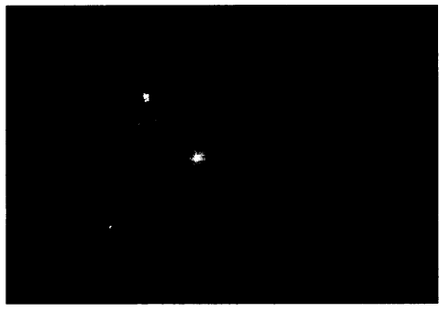
also provide a spur to technological development, says David Nowak, ASCI's leader at Livermore, who notes that the hardware and software will be developed with universities as well as industry. Sidney Karin, director of the San Diego Supercomputing Center, one of four civilian supercomputing centers funded by the National Science Foundation, thinks ASCI's sheer size guarantees that it will shape cutting-edge computer technologies, among them the massively parallel computing that the NSF centers have pursued. "When something as large as the ASCI program comes along and says, 'We need this technology,' that's an enormous endorsement of the activities of our center," says Karin. "This will be significant over time, very, very significant."

Drell adds that the computer databases will offer basic researchers a "treasure-trove" of data on such topics as how metals like plutonium behave under the extreme conditions of heat and density generated in a nuclear blast. Just how much of the data they will be able to examine is still in question, however; a classification review of the nuclear weapons databases is now under way.

Nondefense users will also be able to unleash the computing power developed under ASCI on their own data sets, promises Hassan Dayem, director of computing at Los Alamos, in applications ranging from predicting the spread of forest fires to modeling the spread of AIDS or influenza to designing new drugs. "The only way you know something like this works is when it works on a wide class of problems," explains Nowak. "And if that is the case, it'll work on the [nuclear] stockpile."



LAWRENCE LIVERMORE NAT'L LAB

Bomb in microcosm? Laser beams implode a target at the Nova laser, NIF's predecessor.

But William Dannevik, leader of Livermore's climate system modeling group, isn't sure there will be much time for nondefense work in the computing program. His group's complex models of global warming could be used to "put the [ASCI] machines through their paces," he says. But Dannevik doesn't expect to get enough computer time to refine his models. "ASCI will be extremely focused on moving stockpile stewardship from a test-center program to a computing-centered program," he says. "I just don't think there will be time for unrelated activities."

Other facilities under the stockpile stewardship banner will have to walk the same fine line between basic research and defense work. Los Alamos will spend $35 million to upgrade the Los Alamos Neutron Scattering Center (LANSCE), which harnesses the beam from a proton accelerator to produce a shower of neutrons. The neutron flux will let defense scientists look into aging nuclear weapon components without destroying them. Los Alamos's Goldstone expects the upgraded neutron source to be available as well to outside researchers who want to examine anything from automobile parts to biomolecules.

LANSCE has done double duty in the past, and critics have complained that civilian and defense researchers had to joust for machine time. But Drell thinks that as new weapons development ends, straight weapons research will take up less time. At that point, he says, "bringing in the outside community will be essential for LANSCE. ... Nothing would be worse than building a machine that nobody wants."

Even the hydrotest facilities at Los Alamos and at Livermore's test site in California's San Joaquin Valley could have nondefense spin-offs, say their managers. Hydrotests explode model warheads, made of high explosives wrapped around a core of a heavy metal like depleted uranium, to simulate the implosion that is the first step in triggering a nuclear explosion. Flash x-ray machines then capture images of the implosion in three dimensions. That imaging capability could also be put to use in industrial research—studying the response of a jet engine that has ingested birds, for example. And the control systems being developed for the Los Alamos facility's electron beams, which create the pulses of x-rays that image the explosion, might be adapted to other accelerators, says Burns.

To Happer, though, the labs' efforts to create a new focus for basic science may be self-defeating. He worries that although DOE may be able to sell the program for the next few years, as money gets even tighter, stewardship will fall prey to charges that it is sheer indulgence. "If it begins to look to Congress like support for National Public Radio and the New York symphony, it's going to be funded at the same level they are," he warns.

But Drell is confident that the money will be there if Congress is convinced that nuclear weapons maintenance is the main purpose of the program. He thinks legislators will accept the rationale that without new nuclear weapons to design and test, the laboratories need another way to retain a cadre of first-rate scientists. "What was driving the labs in the past? Building better weapons," he says. "Now we have to provide a new impetus, a challenge by different means."

–Jonathan Weisman

Jonathan Weisman is a science and defense writer at The Oakland Tribune.

NATIONAL ACADEMY OF SCIENCES

NRC Pledges Faster Delivery On Reports to Government

You are the chief of a federal agency, and one of your science programs is beset by technical problems. Rival factions are battling over the design of the project, and the fight attracts the unwelcome attention of Congress. So you turn to the National Academy of Sciences (NAS) and order up an impartial and thorough review. Eighteen months later and $250,000 poorer, your agency gets an answer in the form of a 200-page report recommending changes in the program. In the meantime, however, Congress has come to its own conclusions and canceled it.

An unlikely scenario? Not according to some NAS officials and their government clients, who worry that the academy's deliberate pace risks making some of its studies moot even before they are completed. So the academy is trying to speed up its act—as carried out through its operating arm, the National Research Council (NRC)—by negotiating contracts more quickly, appointing committee members faster, and reducing the number of reviewers of draft reports. "Agency heads say we need to move faster—it's a pretty standard refrain—and they are reluctant to request a report that takes too long to produce," says NAS Executive Officer William Colglazier. The academy has already shown its ability to move more quickly by taking only 5 months to issue a report on the National Aeronautics and Space Administration's (NASA's) Earth Observing System program (*Science*, 22 September, p. 1665).

The quicker pace could help the academy fill some of the gap to be left by the demise of the Office of Technology Assessment (OTA), which Congress abolished this week in part because its slow pace seemed out of synch with the frenetic legislative agenda. This new emphasis on timeliness is also prompted by a decline in income from studies and workshops conducted for the federal government, which is the customer for 80% of the reports done for the academy, the National Academy of Engineering, and the Institute of Medicine (IOM). Revenues peaked at $192 million in 1993 and 1994, says Archie Turner, NAS's chief financial officer. They are now at $176 million and are

likely headed down, he says.

And if financial incentives were not enough of a prod, the academy received a tongue-lashing in May from Daniel Goldin, head of NASA, who blasted it in a speech at the NAS headquarters for taking too long. Without citing specifics, he also questioned its objectivity. NAS President Bruce Alberts asked retired Bechtel executive Harold Forsen to chair a special panel to examine Goldin's charges; its report is due this fall. Coincidentally, that same month the NRC's governing board and staff officers had gathered in a small town on Chesapeake Bay to hash out long-term directions for the organization, particularly in light of federal budget cuts. One outcome of the meeting was a consensus that they must respond more quickly to customers demanding a quicker turnaround on reviews.

This isn't the first time the NRC has tried to pick up the pace of a system that generates about 200 reports a year. In the early 1980s it formed a special panel to conduct a number of rapid, space-related studies requested by Congress. One, which looked at a proposed U.S.–European mission to the poles of the sun, was completed in 6 weeks; its negative conclusion led directly to canceling a NASA spacecraft that was part of the mission.

But the committee encountered "lots of opposition" from within the academy, recalls one NRC staffer. In particular, opponents feared the academy's work could be compromised by the need for a rapid turnaround on politically sensitive topics. "It wasn't all beer and skittles," says its chair, Norman Hackerman, the former president of Rice University. "There was concern we had been put in a dependent position." The committee was disbanded in 1986.

Indeed, there is a built-in tension between those eager to improve efficiency and those intent on upholding high standards, NAS officials say. "The academy is made up of senior faculty members, and the demands of politicians or agencies are of no consequence to most of them," according to one NAS manager. "Their interest is that the academy doesn't make a mistake, so they prefer to err on the side of caution. They are conservative and deliberative."

> **"Quality doesn't improve by sitting on things."**
> **—Val Fitch**

Academy panels have even been known to turn a deaf ear toward politicians' demands to move more quickly. Princeton University physicist Val Fitch, for example, rejected a request by Alberts and Goldin to deliver a report in 2 months on NASA's Gravity Probe-B mission (*Science*, 24 March, p. 1756). He insisted that the study's scientific and technical complexity required a minimum of 6 months—still a lightning pace compared to many reviews. Despite taking that stance, Fitch believes that the current system is at times overly bureaucratic, and he backs the effort to speed up academy reviews. "Quality doesn't improve by sitting on things," he says.

While there are no comprehensive statistics on the speed of NRC reviews, anecdotal evidence already points to a quickening pace. "We seem to be doing more quick-turnaround studies," says Porter Coggeshall, director of the Report Review Committee which oversees the reviewing process of most NRC reports. And Karen Hein, IOM executive officer, says it is hard to find an IOM report that takes 18 months. Three nutrition reports done recently for the World Health Organization were completed in 6 months, she adds.

Colglazier, NRC staffers, and agency officials say there are numerous ways to speed up the process, which begins with an agency requesting a report and ends with a final vetting by an internal review committee. Just negotiating a contract between the NRC and an agency, for example, can take as long as 6 months. One solution is a rolling contract between the NRC and an agency that replaces the need to negotiate individual studies. With money in the bank, the NRC can begin work immediately. A 5-year contract between the NRC's Space Studies Board and NASA helped the board move more expeditiously on the Gravity Probe-B study, for example. Some agencies, however, believe this approach involves too great a financial commitment; indeed, NASA has abandoned this way of doing business with the NRC's Aeronautics and Space Engineering Board, which also conducts NASA-related studies; the Space Studies Board contract ends next year.

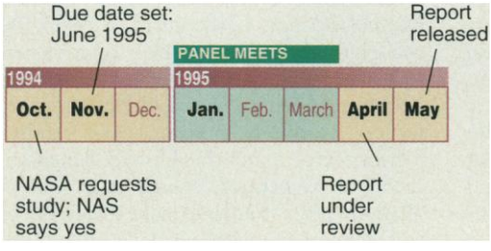
Hein says that choosing committee members and reviewers at the same time and focusing staff attention on a single study can move things along more quickly. Enforcing deadlines for committee members and reviewers is another time-saver. But pressuring reviewers to speed up their work has its limits. "These people are working for free," one staffer says. "And agency heads are foggy on this distinction between people on their payroll and volunteers." Limiting reviewers as well as the amount of space allotted to dissenters could also simplify the process, according to Colglazier.

The demise of OTA serves both as a warning and an opportunity for the academy. "It emphasizes the importance of independent and bipartisan work that moves closer to the legislative rhythms of Congress," says Colglazier. To help snare some of the work that might have gone to OTA, NAS has beefed up its small staff that trolls the halls of Capitol Hill, suggesting to members and their staffs how the academy might be helpful in resolving knotty legislative issues. And the academy's choice of a new head for congressional relations demonstrates an ability to respond quickly to the new political realities: He's Jim Jensen, former legislative chief at OTA.

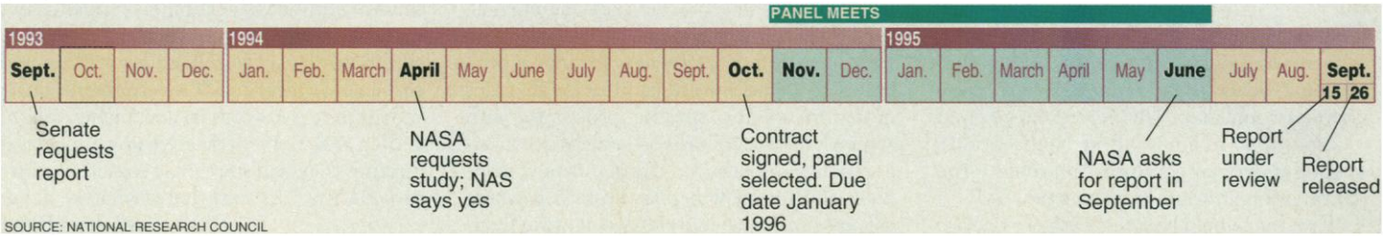
–Andrew Lawler

The Short and Long of Two Academy Studies

Gravity Probe-B Study
(12 panel members, approx. cost $150,000)



Future of Space Science Study
(40 panel members, approx. cost $750,000)



SOURCE: NATIONAL RESEARCH COUNCIL